[001] # DEVICE FOR PREVENTING WOBBLING OF THE PICK-UP GEARS IN A GEARBOX WITH TWO LAYSHAFTS

[002]

[003]

[004] This invention concerns a device to prevent the swaying of the cog wheels positioned on the main shaft in a transmission with two countershafts in accordance with the main concept of the patent claim 1.

[005]

[006] According to the state of technology, the idle wheels used as cog wheels in transmissions with two countershafts are radially guided into both gearings of the countershafts. The cog wheels are guided on the main shaft in the axial direction by the washer disks, whereby a washer disk of the idler wheel is placed between two washer disks on the main shaft. There thus results the disadvantage that relatively large plays are caused by the work tolerances and the opening required for oil lubrication, so that when the loads of the idler wheels are stimulated because of the swaying movements of the main shaft or the oscillating rotary motion, an unpleasant rattling noise arises.

[007] Within the scope of the EP 0361 686 A1, a transmission with a countershaft is proposed where the countershaft gear wheel of the driving mechanism constant is arranged on the countershaft in such manner that the oscillations of the gear wheel are not transmitted to the countershaft because of a small play arising therefrom as well as because of a dampening element connected to the gear wheel and placed parallel to the countershaft in order that, in this manner, the rattling noise is suppressed as much as possible. This design, however, has proven to be very costly and, furthermore, the vibration noises cannot be fully suppressed, since the additional wheels arranged on the countershaft would be interfering with the corresponding idler wheels of the drive shaft unless additional construction measures were undertaken.

[008] The task of the invention is to provide a device to prevent the swaying of the cog wheels arranged on the main shaft or, as the case may be, to avoid the above noted vibration noises in a power train with two countershafts.

[009] This task is solved by the characteristics of the Patent Claim 1. Additional variations and advantages can be seen in the subordinate claims.

[010]

[011] Accordingly, it is recommended, that for the axially guiding of the cog wheels, an additional disk is provided in addition to the washer disk of the cog wheel placed between the two washer disks arranged on the main shaft, which is rigidly connected to the cog wheel and is braced against the face side of the countershaft gearing or the intermediate shaft for the reverse gear. Hereby, it can be foreseen that the cog wheel will be pressed or, as the case may be, pushed by the spring action against the disk. In the process, a disk can be provided for each cog wheel. It is also conceivable that individual cog wheels may be equipped with the disks of this invention.

[012] Within the context of a first especially advantageous variation of the invention, it is foreseen that the disk has a spring-loaded construction, whereby other designs are possible. Thus, for example, in the context of a second variation, it is foreseen that the disk is connected to the cog wheel by at least one bolt guided through the cog wheel, whereby the bolt pushes the wheel in the direction of the disk due to the installed spring. According to the invention, at least three bolts are foreseen for each wheel; however, their number can vary according to the requirements. In place of bolts, other suitable types of fastener devices may be used.

[013] The angle between the end of the disk of the invention facing the countershaft or, as the case may be, the intermediate shaft for the reverse gear and the perpendicular of the countershaft or, as the case may be, the intermediate shaft for the reverse gear in the radial direction preferably amounts to about 3°, but can also assume other values, as well as the value of zero (in this case, the disk is positioned perpendicular to the shaft). Preferably, the contact surfaces are of

a cone-shaped design. A small angle results in the advantage, that a touch line is produced whereby, at the same time, the effect of a lubricated wedge is reinforced. Furthermore, the contact zones are positioned near the pitch circle, so that the sliding parts are kept advantageously as small as possible.

[014] Using the concept according to the invention, the wobbling of the cog wheels is largely prevented in that they are braced by spring-loaded disks on the mounted countershafts or, as the case may be, the intermediate shafts for the reverse gear.

[015]

[016] The invention is explained in more detail in the following examples by way of the enclosed drawings. They illustrate:

[017] FIG. 1 is a representation of a first, especially advantageous execution model of the device, according to the invention, in which the cog wheels mesh with the gearing of the countershafts;

[018] FIG. 2 is a representation of a second, especially advantageous execution model of the device, according to the invention, in which the cog wheels mesh with the gearing of the of the countershafts, and

[019] FIG. 3 is a representation of an especially advantageous variation of the device, according to the invention, using the example of the intermediate shafts for the reverse gears.

[020]

[021] Only the essential parts of the drawings for the invention have reference symbols. FIG. 1 shows a part of the power train with two countershafts 1, 2, whereby cog wheels 3 are radially guided in both gearings of the countershafts 1, 2. In the axial direction, the cog wheels are guided on a main shaft 6 by washer disks 4, 5, whereby the washer disk 4 of the cog wheel 3 is placed between two washer disks 5 positioned on the main shaft 6.

[022] According to the invention, another disk 7 is provided to avoid the vibration noise of each cog wheel 3 which, on the one hand, is connected with the cog

wheels 3 and, on the other hand, is supported on the face side of the gearing 8 of the countershafts 1, 2. In an advantageous manner, the cog wheel 3 is pressed or, as the case may be, pushed against the disk 7 by use of the spring effect, so that the wobbling movements are suppressed.

[023] In the execution example shown in the FIG. 1, the disk 7 is connected to the cog wheel 3 by a bolt 9 guided through the cog wheel 3, whereby the bolt 9 pushes the cog wheel 3 in the direction of disk 7 by way of an installed spring 10. This construction can also be used for the case of the cog wheel which meshes with the intermediate wheels for the reverse gears that are placed on an intermediate shaft.

[024] According to FIG. 2, the execution example shows another variation of the disk 7 according to the invention. Here the disk 7 is designed to be spring-loaded, so that the bolt and spring, according to the execution example in FIG. 1, are not needed.

[025] FIG. 3 shows the concept, according to the invention, using the example of the cog wheel 3 which engages with intermediate wheels 11 for the reverse gears positioned on an intermediate shaft 12. Here the disk 7 has a spring-loaded design.

[026] Naturally, every constructive design, especially each spatial arrangement of the wheels of the disk 7 or, as the case may be, of the spring element, is by itself or together and to the extent that it makes sense technically, under the scope of protection of the submitted claims, without affecting the function of the device, as they are stated in the claims, even when this design is not explicitly represented in the Figures or in the description.

Reference numerals

1 countershaft
2 countershaft
3 cog wheel, idler wheel
4 washer disk
5 washer disk
6 main shaft
7 disk
8 gearing
9 bolt
10 spring
11 gear wheel for the reverse gear
12 intermediate shaft for the reverse gear